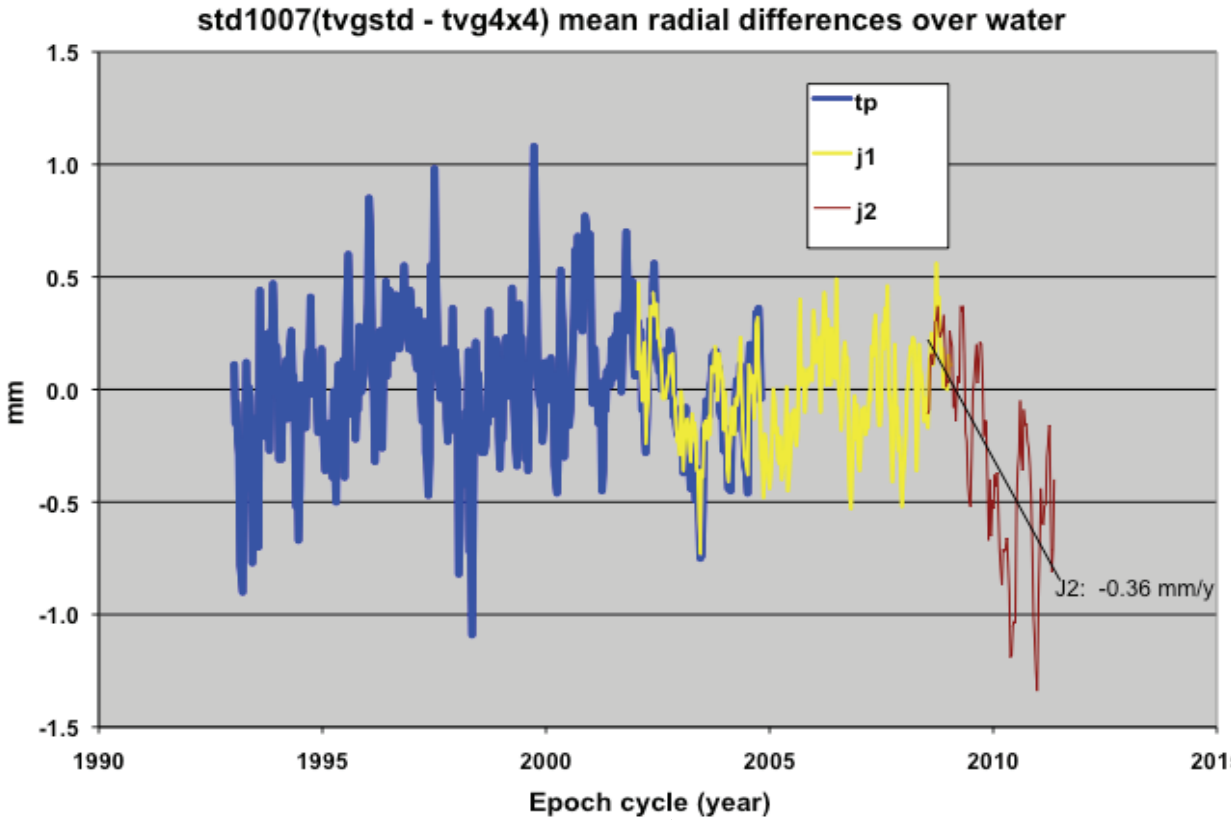
POD SPLINTER SUMMARY

OSTST 2012

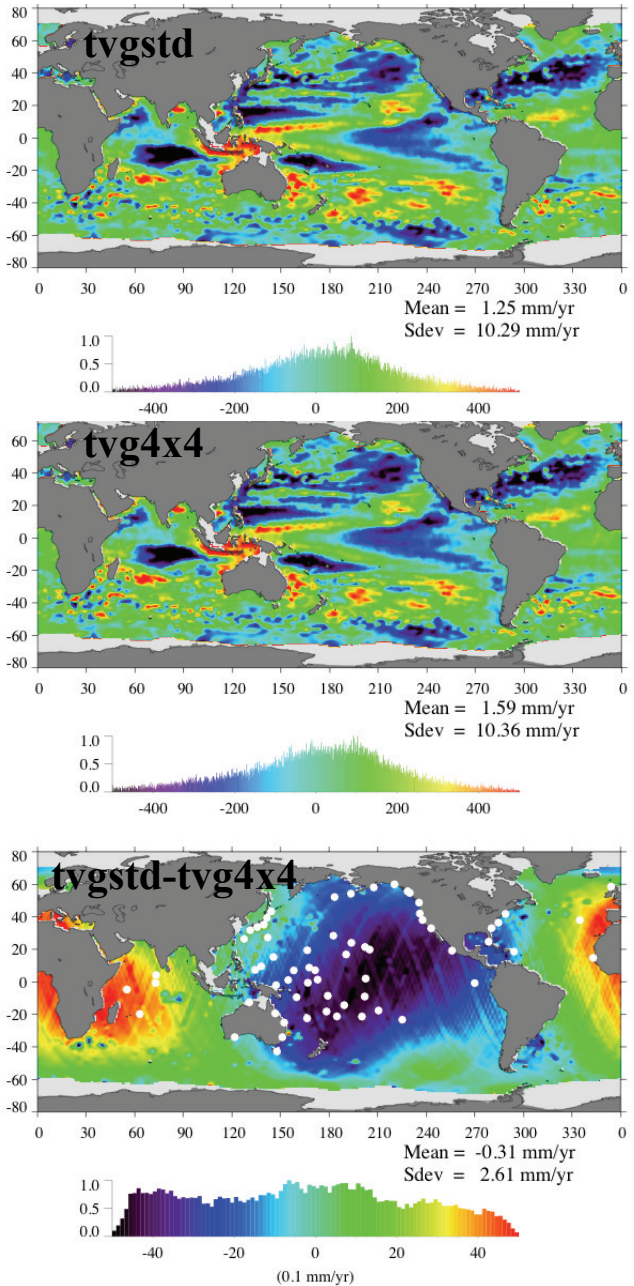
POD Progress and challenges

- Significant progress in the orbit accuracy has been achieved since 2010
- As a result of this progress, improved orbits reveal signals which are significant for MSL applications
- Goal: We are asked to maintain the orbit stability on a regional scale at the 1 mm/year level, over few years

Impact of TVG on Global Mean Sea Level Estimates



Jason-2 MSL Rates



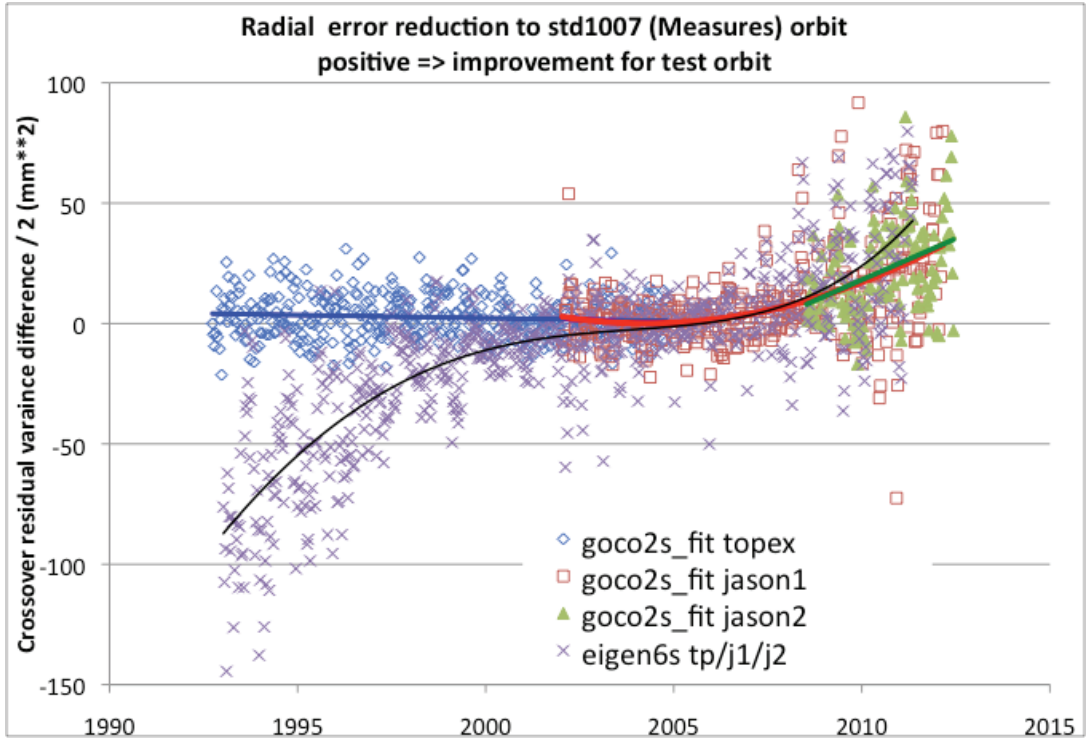
1.25 mm/yr (tvgstd) ⇨ 1.59mm/yr (tvg4x4)

***Possible Jason-2 MSL underestimation* ~ 20%.**

Compromise of accurate accounting of total mass budget over relative short GRACE & Argo observation period (*Beckley et al., 2011*).

Which TVG Model ?

- **Every TVG** model tested by GSFC **improves the orbit over the recent years**. There is increasing evidence (SLR, XOVER residuals) that **GRACE-derived TVG models including rates are the best option to model the TVG field gravity over the 2005-2012** interval for the **operational** orbit production (several type of rates…)

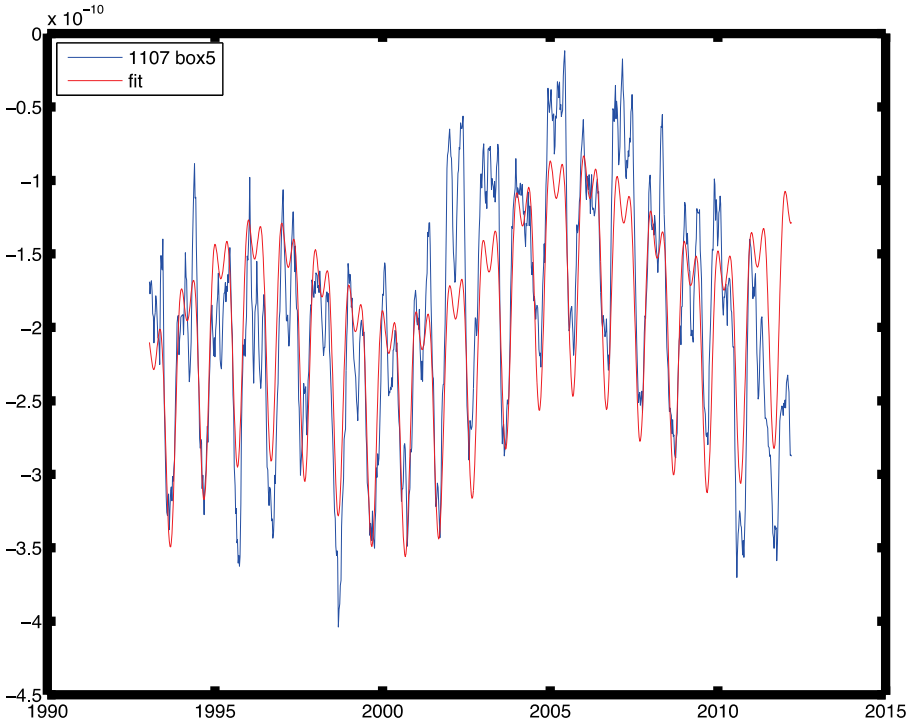


Extrapolation options

- Before GRACE, using only the IERS recommended SLR-based zonal drifts (GDRC or STD0710) would at least not degrade the solution
- A 4x4 SH complement (GSFC) or a mascon complement (CNES) based on DORIS+SLR can be used to reduce dependency on errors in the Time Varying Gravity field outside the GRACE timespan.

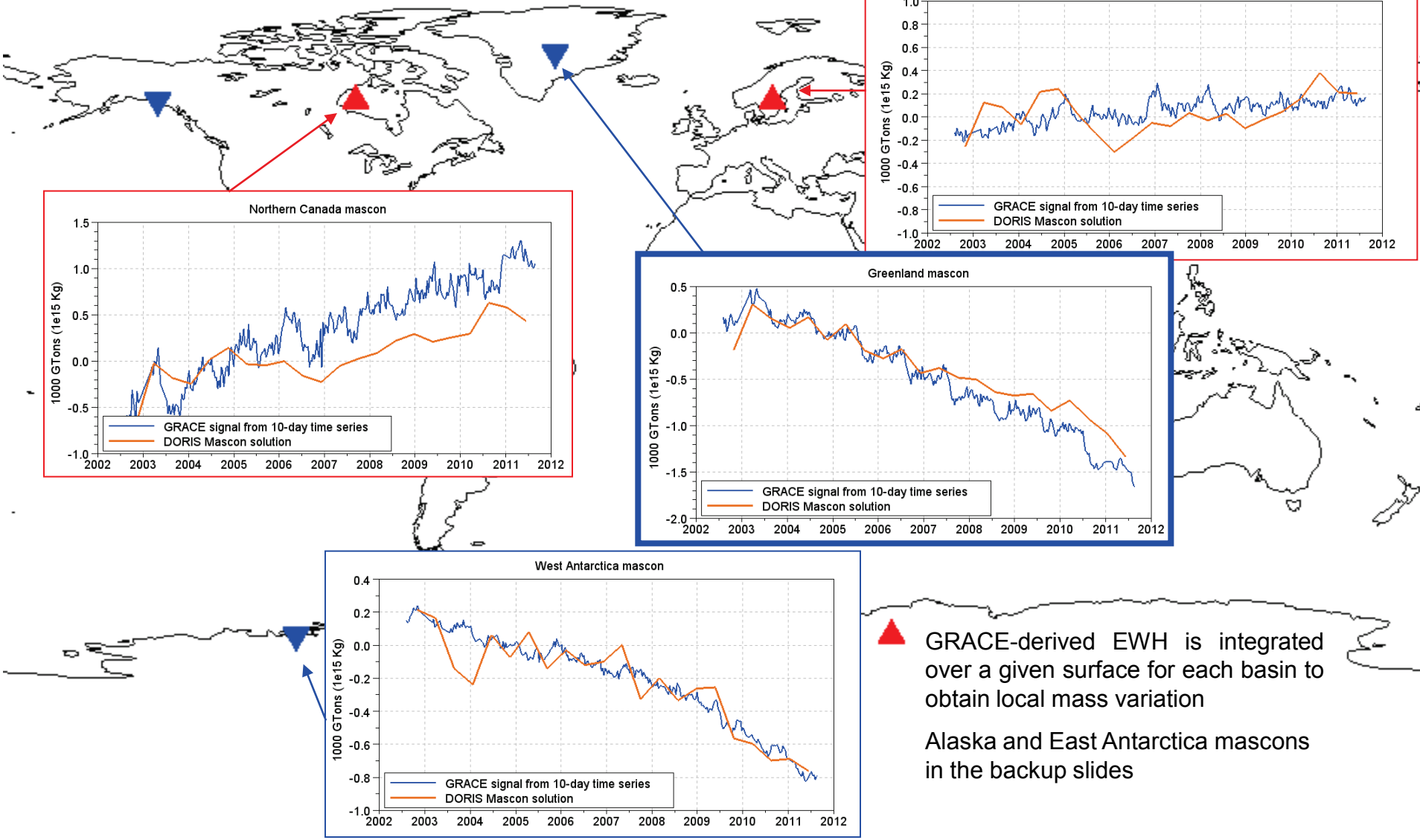
The goco2s_fit TVG model: Examples

C_{20} : estimate trend, annual, semi-annual, 9.3 year



4x4 SLR/DORIS time series (blue curves)
Harmonic Fits to time series (red curves)

DORIS Mascons Vs GRACE time series of EWH

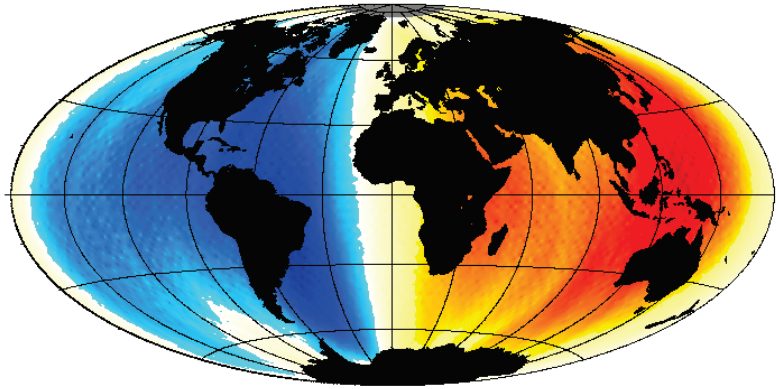


GRACE-derived EWH is integrated over a given surface for each basin to obtain local mass variation

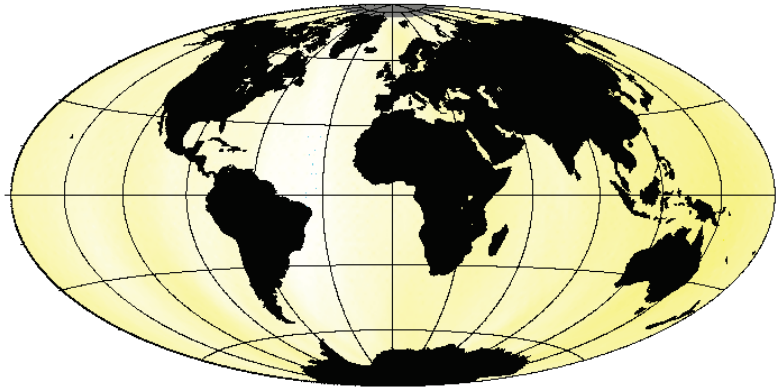
Alaska and East Antarctica mascons in the backup slides

DORIS-based Mascon model on Envisat orbit

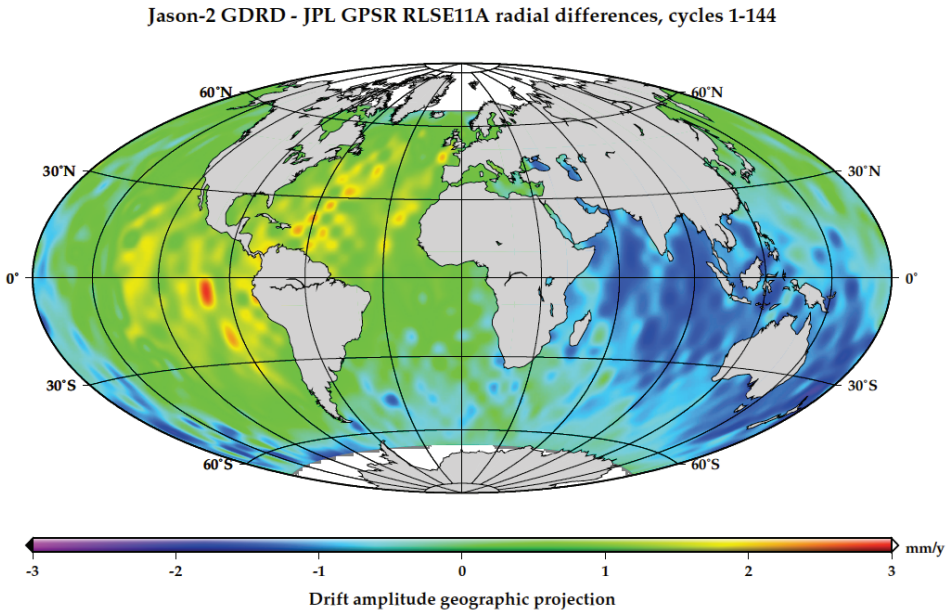
Envisat: 10-day series – GDRD w/o drifts



Envisat: 10-day series – GDRD w/o drifts + DORIS mascon model



Comparison of to JASON2 GDRD to JPL orbits show regional drifts to 2-3 mm/yr level over 4 years



GPS_based reduced dynamic orbits are by construction less sensitive to errors in dynamical models, geopotential in particular. There is some good evidence of that, though **not yet compelling**. JPL provides such a solution since a long time and we suggest to include this orbit solution as a **complementary orbital altitude field** for the high accuracy Jason missions

Improve GPS processing

- In regard to this, POD groups should continue their effort to improve their processing of GPS measurements to maximize the observability, using independent constellation solutions. This effort will ultimately result in an error budget for the reduced dynamic GPS orbits and will **prepare the way for future missions**.

(Mercier et al. CNES integer ambiguity fixing,
Otten et al. ESOC integer ambiguity fixing …)

GPS

- However, given the fact that the current Jason GPS receivers are non-mission critical instruments, **a dynamic orbit solution based on a-set of "consensus" models and in a well defined and stable reference frame should remain the basis of long term mean sea level analysis, on either the global and the regional scale.**

- GPS receivers **should be made mission critical for future missions**

Remainig issues

- Non-conservative force models can still be improved : some evidence of systematic errors with 60-day and 120-day signatures still exist (Grey et al. , UCL models)
- Significance of CoM motion in POD has been further confirmed - though a consensus model for this correction has yet to be reached (Melachroinos et al. poster on geocenter motion)